REMARKS

Claims 1-38 are currently pending in the subject application, and are presently under consideration. Claims 1-38 are rejected. Favorable reconsideration of the application is requested in view of the comments herein.

I. Amendments to the Specification

The Specification has been amended to reflect the current status of co-pending applications. No new matter has been added.

II Interview Summary

Applicant's representative appreciates the courtesy of an Examiner's Interview extended by Examiner Burgess on October 30, 2008. During the interview, Applicant's representative and the Examiner discussed the cited references ofU.S. Patent 5,535,116 to Gupta et al. ("Gupta") in view of US Patent Publication 2002/0129211 to Arimilli et al. ("Arimilli") in further view of U.S. Patent No. 7,032,079 Bauman et al. ("Bauman") failed to teach claimed subject matter. It was further discussed that the deficiencies in the combination of references failed to make obvious claimed subject matter, with particular attention drawn to claims 1 and 6. The Examiner offered no contrary evidence or rebuttal with regard to the deficiencies of the cited art. While no specific agreement was reached regarding the allowability of any claims, the Examiner agreed that further consideration of the differences between the claimed subject matter and the cited references is warranted. This response has been drafted based on the understandings resulting from the telephone interview.

III. Double Patenting Rejection

Claims 1, 16, 24 and 34 stand provisionally rejected for double patenting in view of claims 1, 5 and 6 of U.S. Patent Application No. 10/761,047. A terminal disclaimer will be submitted following the indication of allowable subject matter.

IV. Rejection of Claims 1-38 under 35 U.S.C. 103(a)

Claims 1-38 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,535,116 to Gupta et al. ("Gupta") in view of US Patent Publication 2002/0129211 to Arimilli et al. ("Arimilli") in further view of U.S. Patent No. 7,032,079 Bauman et al. ("Bauman"). Withdrawal of this rejection is respectfully requested.

Claim 1 recites that a first node, which defines a first processor, provides a broadcast request for a copy of data. In rejecting claim 1, the Office Action contends that column 3, lines 16-25 and 59-65, column 5 lines 20-25 and column 10, lines 47-50 of Gupta discloses this element of claim 1 (See Office Action, Page 3). Applicant's representative respectfully disagrees. Each of the cited sections of Gupta is related to a memory system with a directory that identifies a home node for memory partitions (See e.g., Gupta, Col. 3, Lines 3-6). As is known, directory based cache coherency systems are implemented with a point-to-point data read and write system. Nothing in the cited sections of Gupta teaches or suggests a first node that provides a broadcast request for data, as recited in claim 1. In fact, in its background section (not cited by the Office Action) Gupta even discloses that directory based schemes consume a small fraction of system bandwidth without requiring message broadcasts (See Gupta, Col. 1, Lines 32-34).

The differences between Gupta and claim 1 are further clarified when claim 1 and Gupta are considered as a whole. In a directory based cache coherency system, such as the system disclosed in Gupta, no conflict state machine would be included or even be desirable at a processor (e.g., the first node recited in claim 1). In such a system, any conflicting requests for a data block would occur at a home node, and conflicting requestors for data would be arbitrated based on a set of predefined rules at that home node. Thus, as discussed with the Examiner, in Gupta, there would be no reason whatsoever to include a conflict state machine at the requestors. While Applicant's representative acknowledges that the Office Action is not contending that Gupta discloses a conflict state machine, Applicant's representative would like to emphasize that even if the secondary references (Arimilli and Bauman) disclosed a conflict state machine that reads on the conflict state machine recited in claim 1 (which they do not, as is discussed *supra*) there would still be no motivation (or any other reason sufficient to establish a *prima facie* case

of obviousness with respect to claim 1) for one of ordinary skill in the art to include such a conflict state machine at a first node that defines a first processor, as recited in claim 1.

Applicant's representative respectfully submits that differences between the directory based cache coherency system, such as disclosed in Gupta, leads a person of ordinary skill in a path divergent from a system comprising a first node, which defines a first processor, that provides a broadcast request of a copy of data, as recited in claim 1. Moreover, the teachings of Gupta actually weighs in favor of nonobviousness with respect to claim 1, since one of ordinary skill in the art would have no reasonable expectation of success to modify Gupta to operate in a manner consistent with the system recited in claim 1.

Additionally, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest any structure or process that corresponds to a conflict state machine of the first node, as recited in claim 1. In claim 1, the conflict state machine manages non-data responses to the broadcast request for the data provided from the first node, the first node receiving a read conflict response to the broadcast request from the first node, the read conflict response indicating that a second node has a pending broadcast read request for the data, the conflict state machine transitioning to a conflict state in response to the first node receiving the read conflict response, as recited in claim 1. Significantly, Gupta, Arimilli and Bauman, taken individually or in combination, fail to teach or suggest any structure or process that can track the nature or type of non-data conflict responses, as does the conflict state machine recited in claim 1. As a result, there is insufficient evidence to conclude that the approaches in the cited art could be combined to provide a system that operates to resolve a transaction (a broadcast request for data) in the manner recited in claim 1.

As admitted in the Office Action, Gupta and Arimilli fail to teach or suggest a conflict state machine that transitions to a conflict state based on a first node receiving a read conflict response, as recited in claim 1 (See Office Action, Page 4). In an attempt to make up for the deficiencies of Gupta and Arimilli, the Office Action has cited Bauman for Bauman's disclosure of a state machine that can detect and process a conflict between an address associated with a port memory write (PMW) request and an entry associated with an original read request (See Office Action, Pages 3-4, Citing Col. 13, Lines 53-67 of Bauman). Thus, the conflict detected at

the state machine of Bauman is set based on two requests (e.g., the PMW request and an original read request).

In contrast to the conflict state machine recited in claim 1, the state machine in Bauman is not transitioned to a conflict state in response to a first node receiving a read conflict response. Instead, in Bauman, when a conflict is detected, the state machine will set an indicator that causes a response queue 212 to remove a data entry from a read buffer 240A, as this entry contains an outdated cache line that must not be returned with a response to an original read request for the data entry (See Bauman, Col. 13, Lines 56-60). Stated differently, the conflict state machine of the first node recited in claim 1 transitions to a conflict state in response to the first node receiving a read conflict response (e.g., a non-data response). Additionally, in claim 1 the first node fills a copy of data (the data requested by a broadcast request) provided by a third node in a cache associated with the first node based on the state of the conflict state machine. In contrast (as discussed with the Examiner) in Bauman, the disclosed state machine does not fill a copy of data when a conflict is detected, but rather removes a data entry from a read buffer (See Bauman, Col. 13, Lines 57-59). Thus, the state machine disclosed in Bauman does not operate in a manner that could be considered equivalent to the operations of the conflict state machine recited in claim 1.

Significantly, Bauman relates to a main storage unit (MSU) 100 with a transaction tracker queue (TTQ) 204 that includes a state machine 206 for each request for data (See Bauman, FIG. 1, and Col. 8, Lines 34-38). However, Bauman discloses that the MSU 100 is the main memory for a data processing system (See Bauman, Col. 3, Lines 45-48). In contrast to the TTQ tracker 204 (that includes state machines 206) disclosed in Bauman, the first node (that includes a conflict state machine) recited in claim 1 defines a first processor. Nothing in Bauman or any other cited art (including Gupta and Arimilli) would teach or suggest that the TTQ tracker 204 disclosed in Bauman could be implemented in a processor, since the TTQ tracker 204 is implemented in the MSU 100, which provides the main system memory. Accordingly, Gupta taken in view of Arimilli and in further view of Bauman does not teach or suggest the system recited in claim 1, since none of the cited art teaches or suggests a first node that defines a first processor node, and the first node includes a conflict state machine for managing non-data responses to a broadcast request for data, as recited in claim 1.

Moreover, Applicants representative respectfully submits that the Office Action has failed to give all features recited in claim 1 adequate patentable weight. Specifically, claim 1 recites a third node that provides requested data to a first node in response to a broadcast request from the first node, the first node filling the data provided by the third node in a cache associated with the first node based on the state of the conflict state machine. That is, in claim 1, (when claim 1 is considered as a whole), the first node fills a copy of data provided by the third node in a cache associated with the first node even if there are conflicting requests for the data (e.g., between the first and second nodes). During the interview with the Examiner, the Examiner was asked to identify the teachings of the cited art that were being relied on for this element of claim 1, but the Examiner was unable to do so. Additionally, during the interview the Examiner appeared to agree that further consideration of this claimed element was warranted.

Moreover, by employing the system recited in claim 1, data can be filled in a cache such as to resolve the transaction issued by a first node in a conflict situation without having to take other action for certain conflict situations. See, *e.g.*, Present Application, at Paragraphs [0064], [0079], [0094], [0101], and [0104]. The Office Action fails to contend that any structure or process in the cited art corresponds to a first node taking a particular action, such as filling data provided by the third node in a cache associated with the first node based on the state of the conflict state machine, as recited in claim 1.

For the reasons stated above, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest the system recited in claim 1 since Gupta taken in view of Arimilli fails to teach or suggest the conflict state machine recited in claim 1. Moreover, since the Office Action fails to provide any other evidence sufficient to support a legal conclusion of obviousness, Gupta taken in view of Arimilli and in further view of Bauman does not make claim 1 obvious and claim 1, as well as claims 2-15 depending therefrom, is patentable. Accordingly, reconsideration and allowance of claims 1-15 is respectfully requested.

In rejecting claim 6, the Office Action contends that Arimilli discloses the elements of claim 6 (See Office Action, Page 6, citing Pars. [0012], [0026] and [0032] of Arimilli). Applicant's representative respectfully disagrees. The cited sections of Arimilli are related to a first agent issuing a snoop transaction for a target cache line wherein a second agent has a conflicting store request, wherein the target cache line is shared at the first and second agents

(See e.g., Arimilli, Par. [0012]). As discussed during the telephone interview with the Examiner however, there is no teaching or suggestion in the cited sections of Arimilli that either the first agent or the second agent provides a second conflict response to a pending broadcast read request from a second node, as does the first node recited in claim 6. In fact, as the Examiner agreed during the telephone interview, the scenarios being described in the cited sections of Arimilli are silent on the existence of a pending broadcast read request from a second node since, in each such scenario, the target cache line is already in the shared state in the requesting agent's cache. Since the target cache line is already in the shared state, the requesting agent (e.g., the first or second agent) already possesses a copy of the data. Consequently, it would be counter-intuitive for any such agent to issue a source broadcast read request, as recited in claim 6, such that the system of Arimilli would not operate to provide a second conflict response to indicate that a write request broadcast by the first node conflicts with a broadcast read request from the second node, as recited in claim 6. Thus, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest a first node that provides a second conflict response to a pending broadcast read request from a second node, the second conflict response provided by the first node indicating that a write request broadcast by the first node conflicts with a broadcast read request from the second node, as recited in claim 6. Moreover, since the Office Action fails to cite any other evidence sufficient to support a legal conclusion of obviousness, Applicant's representative respectfully submits that claim 6 is patentable.

Furthermore, claim 7 depends from claims 1, 5 and 6 and is patentable for at least the same reasons as claims 1, 5 and 6. Additionally, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest that a broadcast request provided by a first node is broadcast using a first cache coherency protocol, the first cache coherency protocol being chosen by the first node based on the state of the conflict state machine, as recited in claim 7. As stated above with respect to claim 6, from which claim 7 depends, the cited art (particularly Arimilli) fails to teach or suggest a second node reissuing a pending broadcast read request in response to a second conflict response since in Arimilli, the target cache line is already stored in a shared state at the requesting agent's cache.

Moreover, as stated above with respect to claim 1, from which claim 7 depends, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest any process or

structure that corresponds to a conflict state machine, as recited in claim 1. Thus, Gupta taken in view of Arimilli and in further view of Bauman cannot teach or suggest taking the particular action (e.g., choosing a first cache coherency protocol to resolve a transaction) based on a state of the conflict state machine, as recited in claim 7. While Gupta discloses both point-to-point and broadcast transmission modes (See Gupta, Col. 1, Lines 27-42), there is no evidence in Gupta, individually or in combination with the teachings of Arimilli and Bauman, that supports choosing any cache coherency protocol based on a state of a conflict state machine. In fact, in Gupta, the disclosed invention employs only a flat directory-based cache coherency protocol that does not rely on a hierarchical directory structure (See Gupta, Col. 2, Lines 57-65).

Moreover, in rejecting claim 7, the Office Action contends that Bauman discloses the state machine recited in claim 7 (See Office Action, Page 7, citing Col. 13, Lines 53-67 of Bauman). Applicant's representative respectfully disagrees. The cited section of Bauman discloses that a conflict will be detected between an address associated with a PMW request and an entry associated with an original read request, and that in response to the detection of the conflict, a state machine will set an indicator that causes a response out queue 212 to remove a data entry from a buffer 240A (See Bauman, Col. 13, Lines 52-58). However, in contrast to the system recited in claim 7, nothing in the cited section of Bauman (or Bauman more generally) teaches or suggests that a first coherency protocol is chosen by a first node based on a state of a conflict state machine. Therefore, in contrast to the contention of the Examiner, Bauman cannot teach or suggest any structure or process that corresponds to the state machine recited in claim 7. Accordingly, Gupta taken in view of Arimilli and in further view of Bauman fails to make claim 7 obvious since Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest the system of claim 7, and the Office Action has failed to cite any other evidence sufficient to support a legal conclusion of obviousness.

Further still, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest that a broadcast request provided from a first node is broadcast using a source broadcast cache coherency protocol, the broadcast cache coherency protocol being chosen by the first node based on a state of the conflict state machine, as recited in claim 12. For reasons similar to claim 7, Gupta taken in view of Arimilli and in further view of Bauman cannot teach or suggest the system recited in claim 12 since Gupta, Arimilli and Bauman, taken individually

or in combination, fail to teach or suggest a conflict state machine included in a first node that defines a first processor node. Moreover, since the Office Action fails to cite any other evidence sufficient to support a legal conclusion of obviousness, Applicant's representative respectfully submits that claim 12 is patentable.

Claims 16 and 24 recite a conflict state machine (included with a first processor node) transitioning to a first conflict state of a plurality of conflict states if a first processor node receives a read conflict response, the conflict state machine transitioning to a second conflict state of the plurality of conflict states if the first processor node receives a second conflict response. For the reasons stated above with respect to claim 1, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest any structure or process that corresponds to a conflict state machine, as recited in claims 16 and 24. Additionally, since Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest a conflict state machine in a processor node, Gupta taken in view of Arimilli and in further view of Bauman cannot teach or suggest that any particular action is taken, such as the first processor node being operative to implement a cache fill with data provided from a third node (or third processor, as recited in claim 24) if the conflict state machine transitions to a particular state (e.g., a first conflict state), as recited in claims 16 and 24.

Moreover, as discussed above with respect to claim 1, since Gupta, Arimilli and Bauman, taken individually or in combination, fail to teach or suggest any structure or process of a processor that can track and distinguish the nature of different types of conflict responses, as does the conflict state machine recited in claim 16 and 24, the approaches in the cited art cannot be combined to provide a system that operates to resolve a transaction in the manner recited in claims 16 and 24. For these reasons, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest a multi-processor network, as recited in claim 16 or a computer system, as recited in claim 24. Since the cited art fails to teach or suggest a multi-processor network, as recited in claim 16 or a computer system, as recited in claim 24, and the Office Action fails to cite any other evidence sufficient to support a legal conclusion of obviousness, Applicant's representative respectfully submits that claims 16 and 24, as well as claims 17-23 and 25-28 depending therefrom, are patentable.

In claims 17 and 25, different actions are taken depending on the conflict state of a conflict state machine. For the reasons stated above with respect to claims 16 and 24, from which claims 17 and 25 respectively depend, Gupta taken in view of Arimilli and in further view of Bauman does not teach or suggest that any particular action is taken if a conflict state machine (included with a first processor node) transitions to a particular state (e.g., a second conflict state), as recited in claims 17 and 25. While Gupta discloses both point-to-point and broadcast transmission modes (See Gupta, Col. 1, Lines 27-42), there is no evidence in Gupta, individually or in combination with the teachings of Arimilli and Bauman, that supports choosing to issue a request using any cache coherency protocol (such as a forward progress protocol or technique) based on a state of a conflict state machine. In fact, in Gupta, the disclosed invention employs only a flat directory-based cache coherency protocol that does not rely on a hierarchical directory structure (See Gupta, Col. 2, Lines 57-65). Accordingly, Gupta taken in view of Arimilli and in further view of Bauman fails to make claims 17 and 25 obvious since Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest a first processor node being operative to issue a request for the data using a forward progress technique if the conflict state machine transitions to a second conflict state in response to the first processor receiving a second conflict response, as recited in claims 17 and 25, and the Office Action has failed to cite any other evidence sufficient to support a legal conclusion of obviousness.

Furthermore, claims 18 and 26 recite a first processor node that is prevented from implementing a cache fill with data provided by a third node (or third processor, as recited in claim 26) if a conflict state machine transitions to a second conflict state in response to the first processor receiving a second conflict response. For the reasons stated above with respect to claims 17 and 25, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest the elements recited in claims 18 and 26 since Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest that any particular action is taken by a first processor node based on the state of a conflict state machine. Accordingly, Gupta taken in view of Arimilli and in further view of Bauman does not make claims 18 and 26 obvious, since the cited art fails to teach or suggest the elements recited in claims 18 and 26, and the Office Action has failed to cite any other evidence sufficient to support a legal conclusion of obviousness.

For reasons similar to those discussed above with respect to claims 1, 16 and 24, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest means for managing non-data responses to a broadcast request and for transitioning among a plurality of conflict states in response to the non-data responses, as recited in claim 29. Moreover, claim 29 recites that the means for managing non-data responses transitions to a conflict state according to a highest priority non-data response that is received by the provider of the broadcast request. Thus, in contrast to the approaches taught by Gupta taken in view of Arimilli and in further view of Bauman, the conflict state in claim 29 is explicitly determined by the priority of a non-data response to allow certain action (e.g., placing data from the third node in the requestor's cache) to occur based on the particular conflict state.

Furthermore, since Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest means for managing non-data responses to a broadcast request and for transitioning among a plurality of conflict states in response to the non-data responses, as recited in claim 29, Gupta taken in view of Arimilli and in further view of Bauman cannot teach or suggest means for placing the data from a third node in a cache associated with the first node in response to a read conflict response from a second node causing the means for managing non-data responses to transition to a conflict state, as recited in claim 29. Moreover, since the cited art fails to teach or suggest the system recited in claim 29, and the Office Action has failed to cite any other evidence sufficient to support a legal conclusion of obviousness, Gupta taken in view of Arimilli and in further view of Bauman does not make the system recited in claim 29 obvious. Accordingly, claim 29, as well as claims 30-33 depending therefrom, is patentable.

For the reasons similar to those discussed above with respect to claim 1, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest the method of claim 34. Moreover, since the cited art fails to teach or suggest the method recited in claim 34, and the Office Action has failed to cite any other evidence sufficient to support a legal conclusion of obviousness, Gupta taken in view of Arimilli and in further view of Bauman fails to make claim 34 obvious. Thus, claim 34, as well as claims 35-37 depending therefrom, is patentable.

For the reasons stated above with respect to claims 1, 16, 24 and 29, Gupta taken in view of Arimilli and in further view of Bauman fails to teach or suggest the computer system recited in claim 38. In particular, claim 38 recites a hybrid cache coherency protocol that can choose a

particular protocol (e.g., a source broadcast protocol or a forward broadcast protocol) based on the nature of source broadcast conflict responses in the computer system. Significantly, no node, as taught by Gupta, Arimilli and Bauman includes any structure or process that can choose a protocol based on the nature and priority of a conflict, as does the computer system recited in claim 38.

In rejecting claim 38, the Office Action contends that Gupta discloses all of the elements of claim 38 (See Office Action, Page 23, citing Col. 4, Lines 4-6, Col. 10, Lines 61-67 and Col. 13, Lines 30-35 and 60-65 of Gupta). Nothing in the cited sections of Gupta (or Gupta more generally) appears to be related to any choosing of a protocol based on the nature and priority of a conflict, as does the computer system recited in claim 38. Instead, the cited sections of Gupta are related to a copy of data being transferred from a master processing node to a local processing node (See e.g., Gupta, Col. 4, Lines 4-6). Consequently, the approaches taught in Gupta, Arimilli and Bauman can not operate (individually or in combination) to resolve a transaction in the manner recited in claim 38. Therefore, since the cited art fails to teach or suggest the computer system recited in claim 38, and the Office Action fails to cite any other evidence sufficient to support a legal conclusion of obviousness, Applicant's representative respectfully submits that Gupta taken in view of Arimilli and in further view of Bauman fails to make claim 38 obvious, and claim 38 is patentable.

V. CONCLUSION

In view of the foregoing remarks, Applicant respectfully submits that the present application is in condition for allowance. Applicant respectfully requests reconsideration of this application and that the application be passed to issue.

Should the Examiner have any questions concerning this paper, the Examiner is invited and encouraged to contact Applicant's undersigned attorney at (216) 621-2234, Ext. 106.

No additional fees should be due for this response. In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to Deposit Account No. 08-2025.

I hereby certify that this correspondence is being transmitted to the U.S. Patent and Trademark Office via electronic filing on November 7, 2008.

Respectfully submitted,

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